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HFC-125 as a Halon 1301 Simulant.

Halon replacement is the goal of this project. However, information has not been provided to accomplish such within the FAA, nor has an applicant approached the FAA with such intention. However, during the interim period, any action to minimize the discharge of halon for events other than fire suppression is perceived to be a step in the correct direction. Other entities have moved in such a direction already, on both the business and the regulatory sides. Efforts by the U. S. Navy (ref. 2), National Institutes of Standards and Technology (ref. 6), Walter Kidde Aerospace (ref. 3, 4), the Boeing Company (ref. 1), and Shorts Brothers PLC (ref. 5) have provided information to support such a concept for the engine nacelle. Outside the engine subgroup, but within the IHRWG, the cargo replacement effort is also moving in this direction.

During April 1998, two tests were run in the same ventilated engine compartment to capture further data. The results are presented as Figures 1-4. The agent distribution and storage systems were identical. Pertinent statistics for the simulator used in this test pair are listed in Table 2.

Table 2. Nacelle Statistics for April 1998 Simulant Test Pair

Parameter	general	Halon 1301	HFC-125
ambient temperature	64°F (18°C)		
barometric pressure	30.2" Hg (767 mm Hg)		
relative humidity	42%		
nacelle airflow rate	2.1 lb/s (0.95 kg/s)		
nacelle inlet airflow temperature	107°F (42°C)		
nacelle compartment air change rate	2-3/min		
agent charge weight		5.50 lb (2.50 kg)	4.25 lb (1.93 kg)
bottle pressure		600 psig (41.3 Bar)	600 psig (41.3 Bar)
bottle temperature		ambient	ambient

As seen in the comparisons of the gas analyzer data, the results are qualitatively striking. For comparison purposes, each concentration trace has been reviewed to determine the time elapsed to achieve each of the 4, 6, 8, and peak percent volumetric concentrations. Additionally, the duration the concentration was at or above 6 percent volumetric concentration was determined. Halon 1301 is treated as the standard for all error estimates. The error in the duration to achieve the specific concentrations ranged from +15.4/-28.6 percent. The range of error in the peak concentrations were +5.9/-0.8 percent. The error associated with the time each trace was at or above 6 percent volumetric concentration was +13.8/-0 percent. For this pair of tests, the largest noted discrepancies during the increase in agent concentration reflect differences of 300 milliseconds and 0.7 percent volumetric concentration between the agents. The largest differences in the peak value concentrations was 0.5 percent volumetric concentration. The largest difference between the durations the traces were at or above 6 percent volumetric concentration was 400 milliseconds. Based on these results and observations when considering the general concept for the over-design of Halon 1301 systems, an interim opportunity to reduce halon emissions for other than fire suppression purposes is offered by using HFC-125 as a simulant for Halon 1301 in this application.

The simulation procedure followed for this test pair is now listed :

1. Determine quantity of Halon 1301 required to protect the zone in question.

2. Multiply the weight of Halon 1301 by a factor of 0.77; this is the weight of HFC-125 to place in the extinguisher bottle to simulate the halon distribution.

3. Super-pressurize the bottle with nitrogen as would be done for the Halon 1301 charge.

4. Perform the discharge at the desired condition with gas analysis equipment capturing the test.

5. The data showing the comparisons in the graphs was converted by reference to the respective gas calibration curves.

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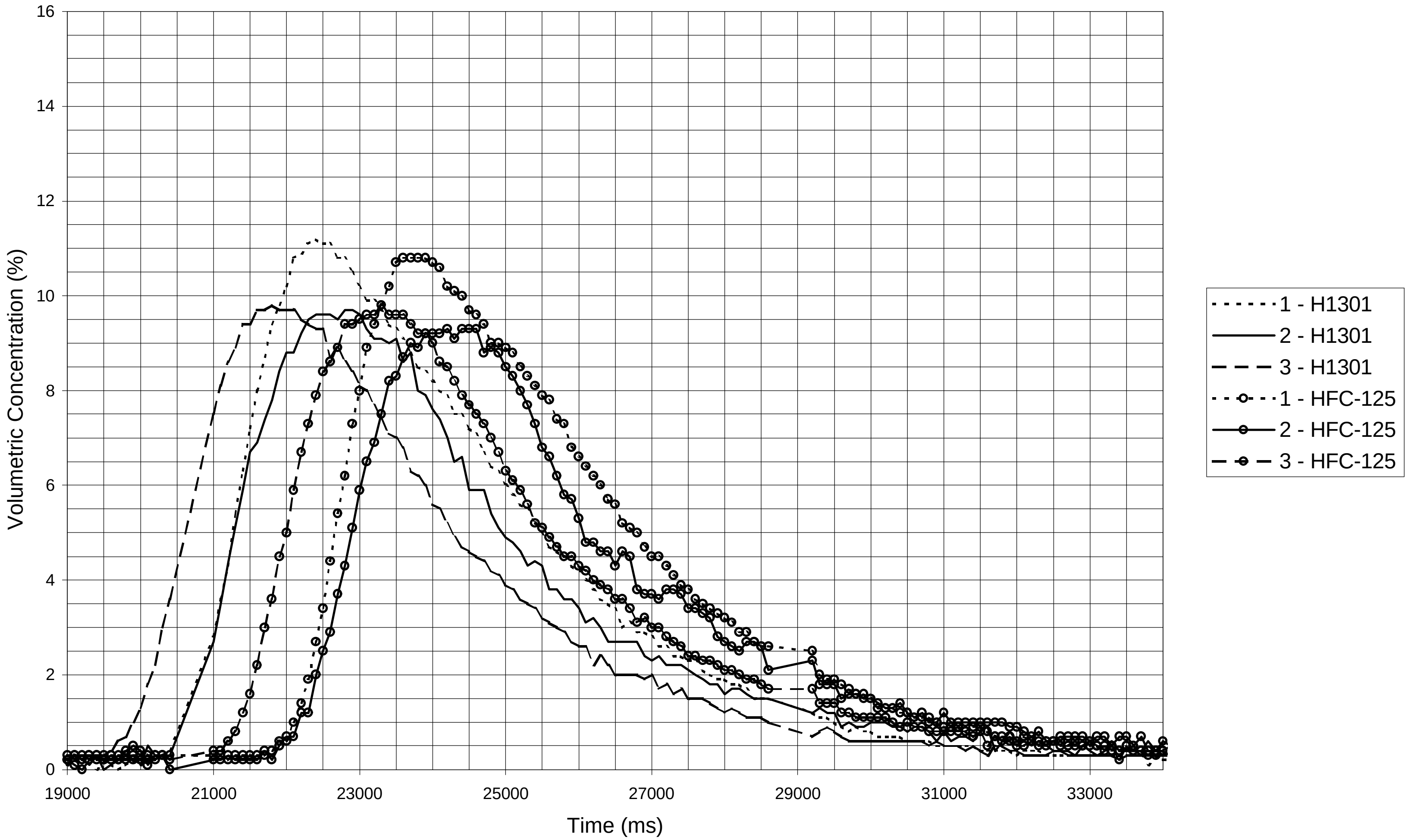

Figure 1. HFC-125 and Halon 1301 Comparison, Channels 1-3

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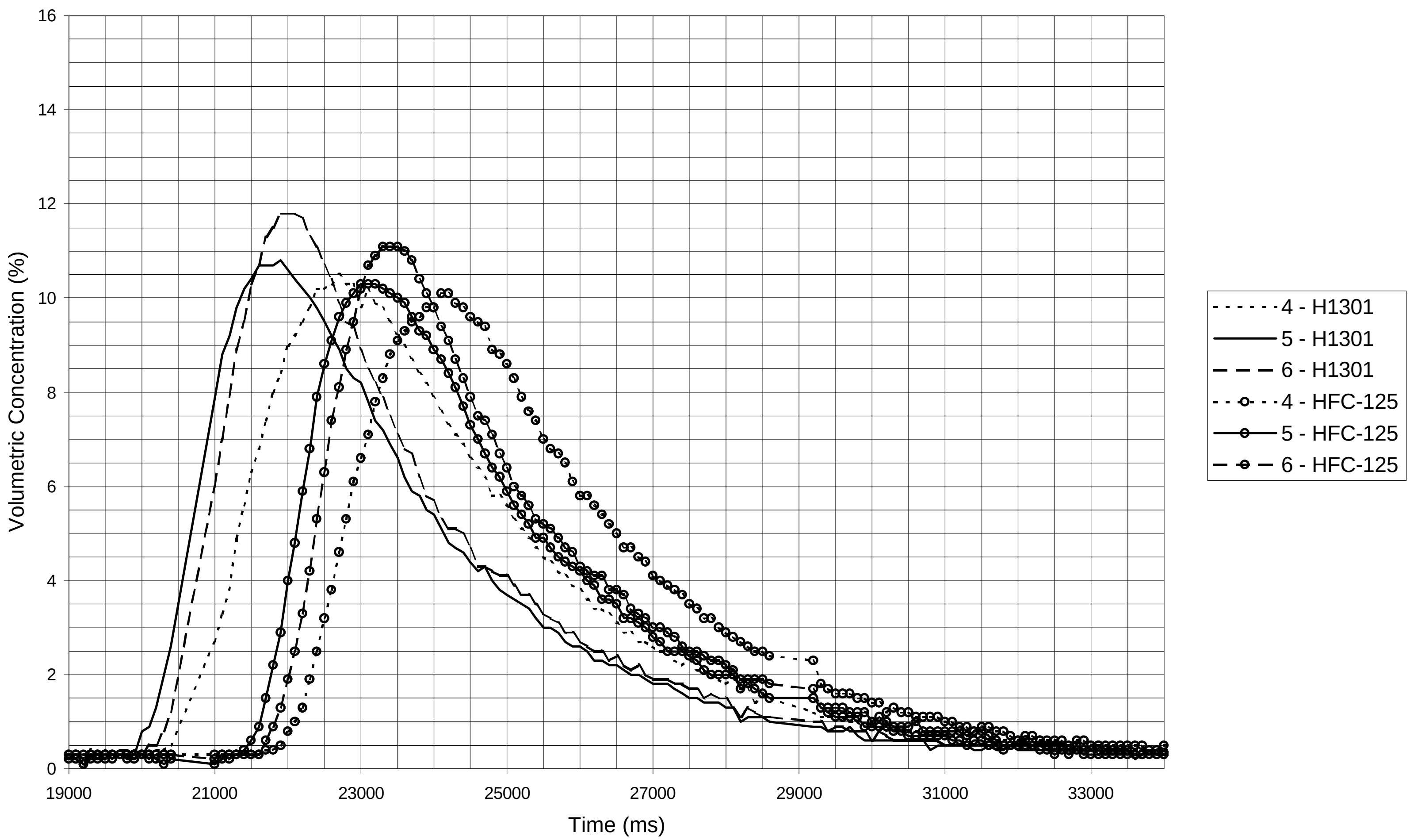

Figure 2. HFC-125 and Halon 1301 Comparison, Channels 4-6

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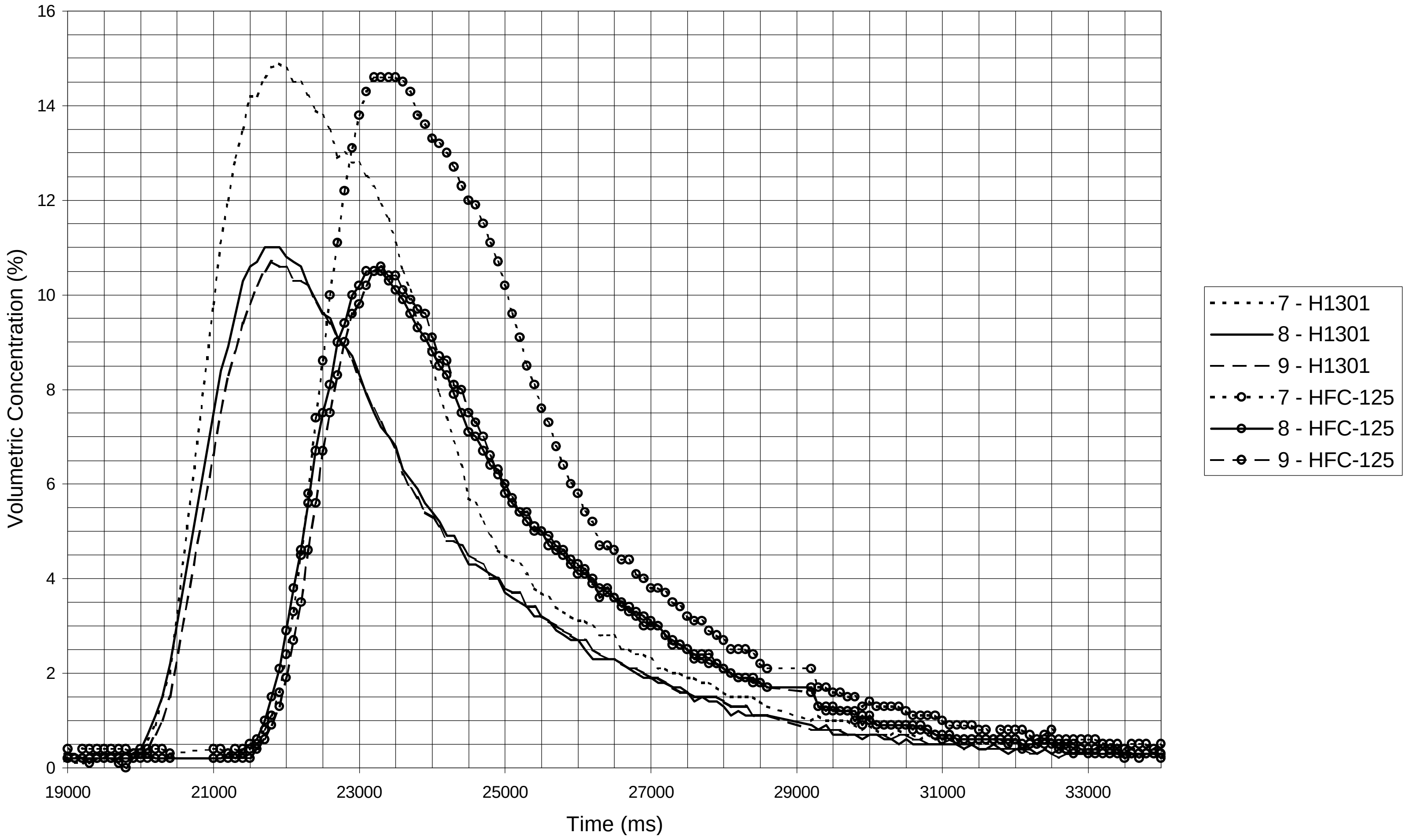

Figure 3. HFC-125 and Halon 1301 Comparison, Channels 7-9

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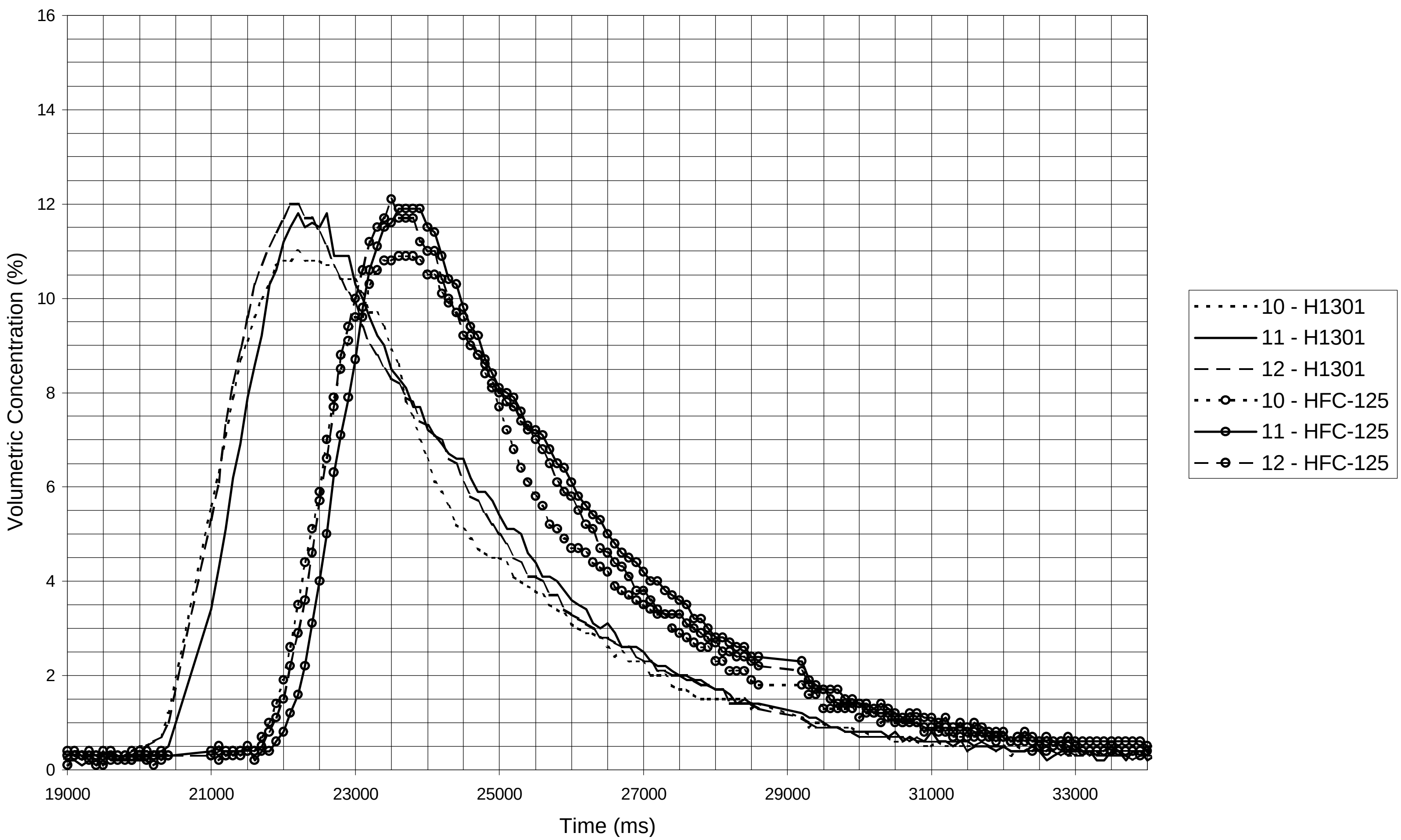

Figure 4. HFC-125 and Halon 1301 Comparison, Channels 10-12